



Financing large scale wind and solar projects—A review of emerging experiences in the Indian context



Swarnalakshmi Umamaheswaran*, Rajiv Seth

Department of Policy Studies, TERI University, New Delhi-110070, India

ARTICLE INFO

Article history:

Received 16 July 2014
Received in revised form
26 February 2015
Accepted 28 February 2015

Keywords:

Renewable policy
India
Renewable financing
Renewable portfolio obligations
IREDA

ABSTRACT

Renewable energy can play a strategic role in India in meeting the country's growing energy demands, as well as combating climate change. Policymakers have recognized this potential and over the last decade have intensified their efforts towards creating a conducive regulatory and policy framework. Policy instruments such as renewable obligations, feed-in-tariffs and generation based incentives have specially aided the transformation towards large scale generation, enabling higher efficiency and lower costs of generation. However, financing has emerged as a significant barrier for sustaining the momentum gained in recent years. Given this background this paper provides an overview on the evolution of large scale generation and the consequent changes in financing requirements. It further reviews the emerging trends and barriers in the financing landscape and analyses the impact of policy performance in this context. Finally, it considers the design of a national renewable finance framework complete with targeted finance push instruments that can complement existing demand pull policies in facilitating investment.

© 2015 Elsevier Ltd. All rights reserved.

Contents

1. Introduction	167
2. National renewable targets, large scale business models and financing dynamics	168
2.1. Scaling up on-grid clean energy—Investment projections	168
2.2. Evolution of large scale grid connected projects	168
2.2.1. Wind	168
2.2.2. Solar	169
3. State of renewable energy financing in the Indian context	171
3.1. Debt financing	171
3.1.1. Macroeconomic factors	171
3.1.2. Banking limits to exposure	171
3.1.3. Creditworthiness of off-takers	171
3.1.4. Risk perceptions among the financing community	171
3.2. Foreign currency borrowings	171
4. Renewable energy policy & financing inter-linkages	172
4.1. Renewable policy design and financing implications—A review of global experience	172
4.2. Policy and financing: Interactions in the Indian context	172
4.2.1. The Indian RPO—An outline	172
4.2.2. Policy effectiveness—Implications for financing	173

Abbreviations: RE, renewable energy; NAPCC, National Action Plan on Climate Change; RPO, renewable portfolio obligations; MNRE, Ministry of New and Renewable Energy; IPP, Independent Power Producers; AD, accelerated depreciation; GBI, generation based incentives; FITs, feed-in-tariff; NBFC, Non-Banking Financial Companies; ECB, external commercial borrowings; EXIM, Export Import Bank; NEA, National Electricity Act 2003; NEP, National Electricity Plan 2005; NEP, National Tariff Policy 2006; RPS, renewable portfolio standards; REC, renewable energy certificates; PPA, power purchasing agreement; IDF, infrastructure debt fund; PFM, public finance mechanism

* Corresponding author. Tel.: +91 9582222457.

E-mail addresses: uswarna@gmail.com, swarnalakshmi@students.teriuniversity.ac.in (S.-n. Umamaheswaran).

5. Beyond renewable policy—A national RE finance approach	174
5.1. PFMs for mobilizing debt from commercial financing institutions	174
5.1.1. Partial credit guarantees	174
5.1.2. Resource insurance	174
5.1.3. RE credit lines for senior debt	174
5.2. PFMs for debt support programs	174
5.2.1. Infrastructure debt	174
5.2.2. Green bonds	175
6. Further research	175
7. Conclusion	175
Acknowledgement	176
References	176

1. Introduction

Renewable energy has risen to the forefront of international efforts towards combating climate change in the last decade. Although primarily motivated by its emission reduction potential, the argument for RE is also valid in the context of other goals such as energy access and security. Markedly so for developing countries where RE assumes strategic importance in achieving larger developmental goals while sustaining economic growth that is delinked from the consumption of fossil fuels.

Among emerging economies, India and China are central to any discussion on global carbon emissions given their population size, relatively higher economic growth and energy use profiles. Over the last decade, India has emerged as the fourth largest energy consumer in the world ranking next to China, United States and Russia [1]. Nearly 60% of its total energy consumption is in the form of electricity [2]. Power generation is further skewed towards fossil fuels with almost 80% generation being sourced from thermal plants. As a result, the power sector has a significant share in overall emissions. The official estimate by the Planning Commission of India places the power sector at the top of the list, contributing to almost 38% of the overall CO₂ emissions [3]. Against this backdrop, the transition to clean energy based power generation can yield substantial dividends towards meeting its voluntary emission reduction targets and help India to contribute towards the global mitigation effort. Beyond climate commitments, increasing the share of renewable energy can also play a vital role in meeting India's developmental challenges related to rural electrification, energy access and security [4–6].

Scaling up clean energy is also commercially justified due to its renewable energy potential as well the growing demand for electricity across several sectors. India has exploitable potential across several renewable resources. However, wind and solar technologies rank the highest for their scalability, maturity and commercial feasibility. Official estimates by the MNRE place India's wind resource potential at about 102 GW even while other studies with alternative assessment methodologies place it as high as 2000 GW and above [7–10]. Similarly given its geographical location, most of the country receives a high average global insolation of 5 kW h/m²/day [11,12] positioning solar power right next to wind in terms of techno-economic feasibility. Although India has made substantial progress in building its RE capacity in the past, most of its potential remains untapped providing enormous opportunity for large scale deployment.

However, commercial deployment as envisaged by the state dictates certain conditions to be met. The first and foremost is the presence of a policy environment that can nurture renewable market development. India has made considerable strides in this direction as demonstrated by the introduction of a number of renewable specific policy instruments over the last decade. Policy tools span from technology based feed in tariffs, renewable obligations, to a host of incentives both fiscal and performance based with the objective of deploying large scale grid connected renewables.

Second, any ambitious RE program necessitates stable financing that can engage, support and nudge the private sector towards market participation. While financing is a continuous theme over the entire technology development continuum, the term 'financing' in this article specifically refers to the funding of generation capacity that is crucial for large scale deployment of RE technologies. However in the current scenario, financing is perhaps the weakest link in the overall ecosystem due to the confluence of several factors. To begin with, an underdeveloped financial market entails that a supply of finance is predominantly restricted to the country's banking system. This dependency fosters significant barriers for infrastructure financing in general. Further, the capital intensity of renewable projects means a higher proportion of debt service, making them vulnerable to regulatory risks. Finally there is limited information available on long-term technology performance in the local context. These factors together lead to lesser availability of finance and higher costs of financing that in turn can significantly dampen technology diffusion.

In light of these issues, this article investigates in detail the state of renewable energy financing in India. More specifically, the article focuses on analyzing the barriers to private finance for promoting generation capacity. Consequently coverage of technologies is limited to utility scale¹ grid connected solar PV and wind based electricity generation. Lower transaction costs, fairly established implementation mechanisms and incentive structure have rendered the utility scale format compatible for private sector participation [13]. This is not to say that off-grid technology options and stand-alone systems are irrelevant for the nation's clean energy goals. On the contrary, decentralized technology options have interesting applications in the context of rural electrification, agricultural productivity and overall socio-economic development [14]. However their underlying market structure, regulatory framework, supply chains and financing are still evolving. Naturally their study merits exclusive investigation and hence are beyond the scope of this article.

The organization of the article is as follows. Section 2 provides an overview of India's renewable goals, associated investment requirement for scaling up on grid clean energy and evolving business models. Section 3 surveys recent experience and barriers to financing, particularly in the aftermath of the nation's regulatory push towards mainstreaming renewable electricity. Section 4 studies impact of regulatory framework and policy performance on financing. Finally, Section 5 provides holistic view of a national RE finance strategy beyond the current policy framework with recommendations for finance push instruments that can influence both availability and costs of financing for the sector.

¹ For this paper, "utility-scale" is defined as projects of at least 1 MW or larger with a long-term power purchase agreement with distribution companies.

Download English Version:

<https://daneshyari.com/en/article/8116419>

Download Persian Version:

<https://daneshyari.com/article/8116419>

[Daneshyari.com](https://daneshyari.com)